



COUNTY SANITATION DISTRICTS OF LOS ANGELES COUNTY

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JAMES F. STAHL
Chief Engineer and General Manager

March 6, 2006

Los Angeles County Board of Supervisors
Kenneth Hahn Hall of Administration
500 W. Temple Street
Los Angeles, CA 90012

Dear Supervisors:

Board Motion of January 31, 2006
Report on Pharmaceuticals in Drinking Water

At its January 31, 2006 meeting, the Board directed the Department of Public Works, Department of Public Health and the Chief Engineer and General Manager of the Sanitation Districts to develop and implement a public education program regarding disposal of unused prescription drugs and to report on purification methods for water containing traces of prescription drugs. The attached report has been prepared with the input of all three agencies. If you have any questions or require further information about this matter, you may contact me or your staff may contact Mr. Robert Horvath at this office.

Very truly yours,

James F. Stahl

JFS:drs
Attachment

cc: Los Angeles County Department of Health Services
Los Angeles County Department of Public Works
Executive Office of the Board of Supervisors
David Janssen, Chief Administrative Officer, County of Los Angeles

REPORT ON PHARMACEUTICALS IN DRINKING WATER— MARCH 6, 2006

This report is prepared in response to action taken at the January 31, 2006 meeting of the Board of Supervisors.

At the meeting, Supervisor Antonovich stated, "Recent reports have documented that traces of prescription drugs have been found in drinking water stored beneath the San Gabriel Valley. While the Sanitation Districts reports that the water is pure enough to drink, the findings highlight the need to address the way that prescription drugs get into our water."

The Director of Public Works, Director of Public Health, and the Chief Engineer and General Manager of the County Sanitation Districts were directed to:

1. Develop and implement a program to educate the public regarding the dangers associated with disposing of unused prescription drugs and the proper methods of disposal; and
2. Report back to the Board on what purification methods can be implemented

This report to the Board of Supervisors has been prepared with the input of all three agencies.

Background

The Sanitation Districts operate a network of wastewater treatment plants serving about five million people in Los Angeles County. Ten of these plants reclaim a total of nearly 200 million gallons per day of water, which can be recycled for many uses. Three plants provide water for replenishment of the local groundwater basin that must meet strict California drinking water standards and action levels established by the State Department of Health Services, as well as standards for unrestricted recreational contact and for aquatic life. In addition, the practice of groundwater replenishment with reclaimed water has been the focus of thorough research for decades, including epidemiological studies that have shown health outcomes for Los Angeles County residents using this source of drinking water are not significantly different than for the population at large.

Reclaimed water from the Sanitation Districts' water reclamation plants has been a source of replenishment for the aquifer beneath the San Gabriel Valley for nearly forty-five years. The reclaimed water is one of the many sources recharging this aquifer and is a valued resource. The effluent used for recharge is further treated by soil aquifer treatment (discussed below) and diluted with purchased water, stormwater, and/or native groundwater before reaching drinking water wells. It is important to note that the January 30th article in the Los Angeles Times reported on the concentrations of pharmaceuticals in Sanitation Districts' treated effluent used for groundwater recharge,

not actual groundwater samples. The Sanitation Districts has focused much of its recent research on emerging contaminants in wastewater, including pharmaceuticals and personal care products, even though there are no monitoring or effluent limits applicable to them.

Pharmaceuticals and personal care products enter wastewater treatment plants when people taking medications excrete the drugs and associated metabolites, rinse them from their bodies during bathing, or flush unused medications down toilets or drains. Industrial discharges and stormwater runoff entering wastewater treatment plants also may contain pharmaceuticals and other types of chemical contaminants. Pharmaceuticals most commonly found in sewage include caffeine (stimulant), acetaminophen, naproxen, ibuprofen (all analgesics), and gemfibrozil (lipid regulator for cholesterol control). Concentrations of these compounds are in the micrograms per liter ($\mu\text{g/L}$), or parts per billion, range (equal to about a drop of water in a swimming pool). Several antibiotic drugs (sulfamethoxazole, trimethoprim, and erythromycin- H_2O) and the nonprescription antibacterial agent triclosan (used in toothpaste, deodorant soaps, antiperspirants, body washes, detergents, dish washing liquids, cosmetics, lotions, antimicrobial creams, and soaps) are present at hundreds of nanograms per liter (ng/L), or parts per trillion (ppt), range (about a drop in a thousand swimming pools). Concentrations of natural and synthetic sex hormones (estrogens and androgens) are also detected in the treatment plant influent at concentrations ranging from a few hundred to less than 1 part per trillion.

Public Education Program Status

A public education program about pharmaceuticals is already in progress as a result of efforts over the past year. The Sanitation Districts, City of Los Angeles, Orange County Sanitation District and City of San Diego, in partnership with the California Pharmacists Association and the California Poison Control System, are scheduled to kick off the *No Drugs Down the Drain* program on March 19, 2006 during National Poison Prevention Week. The *No Drugs Down the Drain* program is a public outreach tool to alert certain California residents about the problems associated with flushing unused, unwanted, and expired medications down the toilet or drain and to provide them with alternative, proper disposal options.

The primary element of the program is a two sided, bilingual information card that discourages the flushing of unused medications and, as alternatives, recommends taking them to a household hazardous waste (HHW) collection center/event (the Sanitation Districts and the Department of Public Works currently accept pharmaceuticals at Los Angeles County Board of Supervisors' HHW events) or disposing of them in the trash in a sturdy and secure container. The card was developed with input from a broader group of public agencies, including the California Integrated Waste Management Board, interested in residential pharmaceutical disposal.

The intent is to distribute the cards to pharmacies that will then distribute the cards to customers as prescriptions are filled. The Department of Health Services will distribute

the information at their clinics and pharmacies. The Department of Public Works Building and Safety Division plans to hand out cards at its headquarters and field offices. There will be an associated website to provide more detailed information such as why flushing is a problem, HHW collection event links, discussion of controlled substances (which will not be accepted at the HHW events because of restrictive Drug Enforcement Agency requirements), tips on how to more safely dispose of medications, etc.

The card graphics have now been printed (copy attached), and it is anticipated that cards will be mailed to the pharmacies during the first two weeks of March with an introductory letter from the wastewater organization in whose service area it resides (there are approximately 725 identified pharmacies in the Sanitation Districts' service area). Each pharmacy will initially receive a box of 2,000 cards. The website is currently under development with the domain name www.nodrugsdownthedrain.org and is planned to be completed by the time the program is introduced.

Programs to collect and properly dispose of unwanted pharmaceuticals are quite new, and there are still opportunities to expand and improve them. For example, HHW events take most pharmaceuticals, but not controlled substances; hospitals and other health care facilities need ways to properly dispose of waste medications; and "take back" programs at pharmacies have been suggested. However, there are still hurdles to overcome before these and other options could be implemented. The agencies and the California Pharmacists Association are continuing to work together to improve the programs. The public education program will evolve as the underlying programs change.

Purification Methods

The wastewater treatment processes employed at the Districts' tertiary reclamation plants remove significant fractions (>99%) of natural and synthetic hormones and such pharmaceuticals as acetaminophen, naproxen, and ibuprofen (all analgesics) and caffeine (stimulant). However, not all pharmaceuticals are removed by the existing extensive treatment processes.

During the groundwater recharge process, reclaimed water is typically mixed with storm water or imported water, and many chemicals that remain in the water are naturally attenuated through adsorption and biodegradation. This process is called "soil aquifer treatment" or "SAT". Data from SAT systems indicate that many of the pharmaceuticals are removed or destroyed, primarily through adsorption or biodegradation, during the first few weeks of passage through the soil/aquifer system. The bacteriological degradation associated with SAT actually destroys these contaminants. Destructive removal avoids the need to treat and dispose of the contaminated and concentrated brine associated with other treatment technologies such as reverse osmosis. However, certain recalcitrant compounds including antiepileptics, carbamazepine and primidone, and iodinated x-ray contrast media may persist during infiltration through the soil.

A number of treatment processes might achieve further removal of certain kinds of pharmaceuticals. Because the chemical characteristics of these chemicals vary widely, no single treatment process is likely to be effective and feasible for all pharmaceuticals in the wastewater. Each of the available treatment options has advantages and disadvantages in terms of effectiveness, feasibility, and cost. In general, the effectiveness of removing pharmaceuticals in water can be ranked, in the order of increasing effectiveness, as UV irradiation, chlorination with free chlorine, ozonation, activated carbon, advanced oxidation (combinations of UV, ozone, and peroxide), and reverse osmosis (RO). Greater levels of treatment are associated with higher costs. It should be kept in mind that some of the treatment processes may produce degradation products or residues with unknown potential toxicity and impact to the environment.

While reverse osmosis is the most effective treatment available for removal of pharmaceuticals, it has several serious drawbacks that must be taken into consideration in any decision-making process. Reverse osmosis does not actually destroy any compounds, but rather removes pollutants from one waste stream and transfers them to another, more concentrated, waste stream. The concentrated waste stream then requires disposal. Two options are available for brine disposal at the Sanitation Districts' treatment plants. The brine can be put back into sewers, where it would travel to the Sanitation Districts' Joint Water Pollution Control Plant and subsequently be discharged to the ocean after secondary treatment. In this case, the pollutants in the brine are, for the most part, simply transferred from one part of the environment to another. The other option is to evaporate the brine. Since space is not available in the Los Angeles Basin for solar evaporation using ponds, a thermal process to evaporate the brines would have to be employed. Such a process would require extremely high amounts of energy, and still leave behind a residue that in turn would have to be disposed.

Another important factor when considering the need to apply treatment is the evolving capability of laboratories to detect ever-smaller concentrations of compounds. Chemicals that would formerly be analyzed at the parts per million or parts per billion level are now being quantified at the parts per trillion level, or even lower. The ability to detect these chemicals at such low levels often exceeds our ability to determine their significance. As a practical matter, it has become impossible to "completely remove" chemicals that might be of concern at some level, because laboratories are developing techniques to detect them at infinitesimally low levels.

The California Department of Health Services is currently developing comprehensive regulations applicable to planned groundwater recharge projects using recycled water which take into account the potential for water quality impacts to underlying groundwater and incorporate numerous elements to minimize adverse impacts. These draft regulations are being used as general guidance for permits being issued for such activities by the Regional Water Quality Control Board. The most recent draft version of this regulation is posted on the CDHS website at <http://www.dhs.ca.gov/ps/ddwem/publications/waterrecycling/rechargeregulationsdraft-12-01-04.pdf>.

Before considering the application of an additional treatment technology, it would be necessary to define the treatment goals for the pharmaceuticals. These goals should be based on information about the toxicological impacts of the trace levels of pharmaceuticals on human health. There are no water quality standards in place for these compounds and most of the studies of these chemicals in the environment have focused on aquatic life, where effects have been observed. The regulatory agencies responsible for responding to the existence of these compounds in drinking water (e.g., USEPA) have concluded that research directed at assessing the significance of these contaminants is the appropriate response at this time, rather than regulatory controls on these compounds or requiring a particular type of treatment to ensure their removal. This strategy reflects the lack of any overt evidence of human health risk posed by the presence of pharmaceuticals at the levels ordinarily found, as well as the common expert opinion that the risk from human exposure is generally not thought to be very significant. This is because a person typically would have to consume water for hundreds of years to receive the equivalent of a single dose of a substance that has been approved for human consumption. However, the potential for subtle effects from long-term exposure to mixtures of pharmaceuticals at very low concentrations is worthy of study to ensure the safety of the water supply. Considerable research is underway worldwide to address this question as well as which treatment technologies are most effective for removing these compounds.

Public Health Implications

The Los Angeles County Department of Health Services has considered the implications of finding traces of prescription drugs in drinking water and has commented as follows: "The various pharmaceuticals contaminants identified in the water at this time are present at extremely low levels. Human health effects from exposure to these contaminants would not occur in adults or children. An adult, child, or infant would need to ingest impossible quantities of this water (thousands of gallons at once) in order to produce an immediate adverse effect on health. However, currently available research does not clearly define possible chronic or long-term health impacts of low-level exposures such as this. Therefore it is reasonable to educate the public and to consider the implementation of water treatment technologies as a precautionary measure."

NO DRUGS DOWN THE DRAIN



Unused prescription and over-the-counter medications that are put in drains or flushed down the toilet pollute the environment, so please take as prescribed and dispose of unused portions properly.

www.nodrugsdownthedrain.org

UNUSED MEDICATIONS SHOULD BE

1

Taken to a household hazardous waste collection center or event (no controlled substances allowed) or

2

Put in a sturdy, securely sealed container, then in a trash can where children and animals can't reach them.



In case of overdose or accidental poisoning, call the poison center at
1-800-222-1222
24 hours/day



california
pharmacists
association

NO TIRE MEDICAMENTOS EN EL DESAGÜE



Todo medicamento recetado o no recetado que sea desechado en el desagüe, lavabo o excusado, contamina el medio ambiente. Tome sus medicamentos como recetados por su doctor, y favor de deshacerse de medicamentos no utilizados de la manera apropiada.

www.california-pharmacists.org

LOS MEDICAMENTOS NO UTILIZADOS SE DEBEN

1

Llevar a un evento o centro para la recolección de desechos domésticos peligrosos (sustancias controladas no serán permitidas), o

2

Poner dentro de un recipiente resistente, sellar y tirar a la basura fuera del alcance de niños y animales.



En caso de sobredosis o envenenamiento accidental, llame al centro de envenenamientos al 1-800-222-1222 las 24 horas.



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